II.—On some Jurassic Species of Cheilostomata.

By J. W. Gregory, D.Sc., F.G.S.;
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THE extraordinary abundance of Bryozoa of the order Cheilostomata which occurs throughout the Cainozoic era, in comparison with their scarcity in earlier formations, has often been remarked. Interesting explanations of the suddenness of their appearance have, moreover, been offered by those who do not attach so much importance, as do some, to the imperfection of the geological record. Cheilostomata are not unknown from earlier deposits: the Cretaceous system has yielded a fair number, while even as early as the Silurian species have been found. Though doubts have been thrown on these early records, there seems no sufficient reason to discredit them. Even if Prof. Nicholson's *Hippothoa inflata* (Hall) [1] should turn out to be a *Stomatopora*, which, if the figure be correct, is most unlikely, there remain many species in later Palæozoic deposits: such are those belonging to Prof. James Hall's genus *Paleschara*,[2] which Mr. Ulrich [3] accepts as Chilostomatous, though Prof. von Zittel [4] includes it doubtfully with the *Ptilodictyonidæ*. Some of the specimens of *Lichenalia*, etc., figured by Hall,[5] as well as the same author's *Cystopora geniculata*,[6] may also belong to this order.

The Jurassic fauna, however, so far contains very few records of Cheilostomata, though Prof. Nicholson [7] remarks that from the Jurassic onward there are abundant remains of this group. Michelin has figured [8] a specimen which he has named *Eschara ranvilliana*, which certainly belongs to the Cheilostomata, though until its internal structure is known it cannot be definitely placed. It must be assigned to the suborder "Athyriata" and probably to either the *Microporidæ* or *Cellariidæ*. The latter is most probable, as species of this family occur on the same horizon in England. Haime [9] has recorded two species: *Terebripora antiqua*, D'Orb., which has not been figured, and the description is insufficient to determine the order to which it belongs; his second species is the *Cellaria Smithi*, Phillips,[10] which he follows Morris [11] in definitely including in

[1] H. A. Nicholson, Descriptions of Polyzoa from the Silurian Formation, Rep. Geol. Surv. Ohio, vol. ii. Palæontology, 1875, p. 268, pl. xxv. fig. 1. The *Alecto inflata* of Hall, Palæontology of New York, vol. i. 1847, p. 77, pl. xxvi. fig. 7.

[2] James Hall, *ibid.* vol. vi. Corals and Bryozoa, 1887, e.g. *Paleschara dissimilis*, p. 35, pl. xv. fig. 11.

[3] E. O. Ulrich, Palæozoic Bryozoa, Palæontology of Illinois, part ii. sect. vi. Geol. Surv. Illinois, vol. viii. 1890, p. 366.

[4] K. von Zittel, Handbuch der Palaeontologie, Palaeozoologie, Bd. I. Abth. I. lf. 4, 1880, p. 604.

[5] James Hall, *ibid.* vol. vi. 1887, *e.g.* pl. xxx. figs. 5 and 6; pl. xxxi. figs. 12, 17, 20, 22, and 29.

[6] *Ibid.* p. 103, pl. lxvi. figs. 7–9.

[7] H. A. Nicholson and R. Lydekker, a Manual of Palæontology, 3rd edit. 1889, vol. i. p. 634.

[8] H. Michelin, Iconographie Zoophytologique, Paris, 1846, p. 243, pl. lvii. fig. 12.

[9] J. Haime, Description des Bryozoaires fossiles de la formation Jurassique, Mém. Soc. Géol. France, ser. 2, t. v. 1854, p. 217.

[10] J. Phillips, Illustrations of the Geology of Yorkshire. Part I. The Yorkshire Coast, 1829, p. 143, pl. vii. fig. 8.

[11] J. Morris, Catalogue of British Fossils, 1843, p. 39.

Hippothoa. Phillips' figure is quite useless; but, with his usual courtesy, Mr. H. M. Platnauer has kindly lent me the type which is now in the York Museum; the species, however, certainly does not belong to *Hippothoa* as that genus is now defined.

In a paper on the British Paleogene Bryozoa[1] I pointed out the occurrence of *Onychocella* in the Jurassic, and, considering the rarity of known species of Chilostomata of this age, I take this opportunity, with the kind permission of Dr. Woodward, of describing this species and one of the genus *Membranipora.* Both specimens are in the British Museum.

Order: CHEILOSTOMATA.

Suborder: ATHYRIATA.

Family: MEMBRANIPORIDÆ.
Genus: MEMBRANIPORA, Blainville, 1834.
Species I.: MEMBRANIPORA JURASSICA,[2] n. sp. (Fig. 1).

DIAGNOSIS.

Zoarium: Erect, foliaceous, bilaminate.

Zoœcia: Regularly quincuncial, form hexagonal, slightly irregular. Opesia very large. Aperture occupying the whole of the opesium and markedly clithridiate in shape. Rim apparently plain, highest

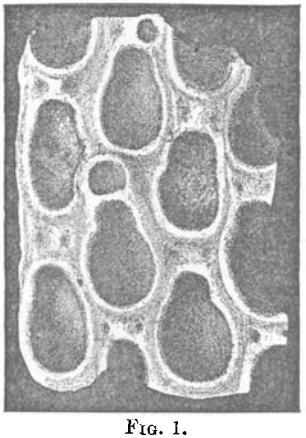

FIG. 1.

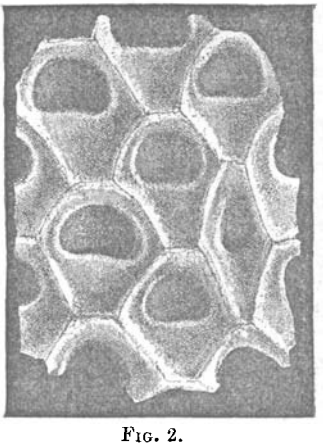

FIG. 2.

on the margin of the aperture, and sloping thence to the inter-zoœcial sutures. Front wall very small in extent, consisting only of a narrow space at the upper end of the zoœcium, sometimes replaced by oœcium.

Oœcium: Cucullate, reniform in shape, surrounded by a low rim. The oœcia are sparsely scattered over the zoarium.

Avicularia: Usually a pair at the upper corners of the zoœcium,

[1] Trans. Zool. Soc. London, vol. xiii. pt. vi. 1893, p. 239.

[2] So named as it is the first recorded Jurassic species of this genus and family.

but sometimes there is only one. The aperture is oval. They are medium in size.

DIMENSIONS: Length of a zoœcium 1·3 mm; breadth 0·85 mm.

DISTRIBUTION: Calcaire à polypiers. (Bathonian.) Ranville, Normandy, France.

TYPE: Brit. Mus. D 180.

AFFINITIES OF THE SPECIES.—This species belongs to a group which is well represented in the Cretaceous, and it is advisable to compare it with the following seven species. From *Membranipora bipunctata*, Goldf.,[1] it differs in that in the latter the aperture is oval, the zoœcia are less regular, and there is but one avicularium; the species are allied in general aspect and the structure of the rim. *M. velamen*, Goldf.,[2] resembles the new species in the shape of the aperture, but it has a more extensive front wall, larger (and possibly vicarious) avicularia, and the shape of the zoœcia is different. *M. cypris*, D'Orb.,[3] agrees in the shape of the zoœcia and the character of the rim, but has an oval aperture and no avicularia. *M. regularis*, D.Orb., agrees in the structure of the avicularia, but the other characters show that the species are clearly different. *M. tuberosa*, Novák,[4] agrees in its general characters, but it possesses numerous vibracularia and is more ornamented. Marsson's figure[5] of *M. lyra*, Hag., shows that this Maestricht species belongs to the same group, but it may be easily distinguished from *M. jurassica* by its oval aperture.

Family: MICROPORIDÆ.
Genus: ONYCHOCELLA, Jullien, 1881.
Species: ONYCHOCELLA BATHONICA, n. sp. (Fig. 2).

DIAGNOSIS.

Zoarium: Encrusting; an extensive thick crust.

Zoœcia: Skittle-shaped, the lower part being like half a hexagon, closed above by a well-rounded arc. Aperture ovato-deltoid with a blunt upper end; the lower margin is entire and but slightly curved and has a somewhat raised thin margin; the aperture is large. Front wall small, triangular, depressed; minutely granular. Raised rim, plain, non-crenulate.

Avicularia: Large, vicarious; long, tapering at each end; irregularly scattered over the zoœcium. Apertures obovate. A small, triangular front wall both above and below the aperture.

DIMENSIONS: Length of a zoœcium; 1 mm.; breadth, 0·8 mm.

[1] *Cellepora bipunctata*, Goldfuss, Pet. Germ. Bd. I. Ht. 1, 1827, p. 27, pl. ix. fig. 7, and Hagenow, Die Bryozoen der Maastrichter Kreidebildung, 1851, p. 76, pl. ix. fig. 9.

[2] *Cellepora velamen*, Goldfuss, *op. cit.* p. 26, pl. ix. fig. 4, and Hagenow, *op. cit.* p. 97. pl. xii. fig. 1, in which the type is refigured.

[3] Pal. Franc. Terr. Cret. t. v. p. 551, pl. 607, figs. 11–12.
Flustrina regularis, D'Orb., *ibid.* p. 306, pl. 702, figs. 17–19. *Flustrina elegans*, p. 302, pl. 701, figs. 17–19, appears to be only a worn variety of this species.

[4] Novák, Beitrag zur Kenntniss der Bryozoen der böhmischen Kreideformation Denk. k. Akad. Wiss. Wien. Bd. xxxvii. Abth. II. 1877, p. 92, pl. i. figs. 1–3.

[5] Th. Marsson, Die Bryozoen der weissen Schreibkreid der Insel Rügen. Pal. Abth. Bd. IV. Ht. 1. 1887, p. 59, pl. v. fig. 17.

Distribution: Calcaire à polypiers (Bathonian.) Ranville, Normandy, France.

Type: Brit. Mus. D 181.

Affinities.—The closest allies of *Onychocella bathonica* are four species from the Cretaceous, which have been described under other generic names. It is unfortunate that there is some doubt about its nearest ally, a Maestrichtien species, described by Hagenow; in his monograph he has given two figures[1] which he assigns to the species *Cellepora* (*Discopora*) *koninckiana*; but the structure of the aperture is so different in the two, that I feel bound to assign them to different species: in his first figure the aperture is mucronate and is small; in the second (fig. 11) the aperture is elliptic, with the longer axis longitudinal, the lower margin is entire, the aperture occupies twice as large an area as in the former, and the avicularia are much larger. I therefore make Hagenow's second figure (fig. 11) into a new species under the name of *Onchyocella hagenowi*. This is the nearest ally of *O. bathonica*, but it differs in the larger size of both the avicularian and zoœcial apertures.

Onychocella piriformis (Goldf.)[2] is another ally, but has a lower zoœcial aperture, while the avicularian aperture is larger and the front wall occurs only above and not on both sides of this. *O. santonensis* (D'Orb.)[3] has a smaller mouth and longer avicularia; *O. solea* (Novák)[4] a semi-elliptical aperture with a mucronate lower margin.

The result, therefore, of the present communication is the first description of Bryozoa of the order Cheilostomata in the Jurassic; the species described belong to the two families of the *Membraniporidæ* and *Microporidæ*; but representatives in this age of the *Cellariidæ*, *Smittidæ*, and other families are also included in the British Museum Collection.

III.—Notes on the Composition of Clays, Slates, etc., and on Some Points in their Contact-Metamorphism.

By W. Maynard Hutchings, Esq.

(*Concluded from the January Number*, p. 45.)

After this substance has been well observed in good occurrences, it is always recognized at once, even as isolated small patches in a slide. It has a very characteristic appearance among the other constituents. It is marked off, for instance, by its special refraction from anything else that occurs in these rocks, and has other characteristics not to be missed when once observed, but not very easy to exactly describe. As soon as it ceases to be quite inert in polarized light, as soon as the speckly polarization sets in, it has also a more or less granular

[1] Hagenow, *op. cit.* p. 95, pl. xi. figs. 10 and 11.

[2] *Eschara piriformis*, Goldfuss, *op. cit.* p. 24, pl. viii. fig. 10; Hagenow, *op. cit.* p. 75, pl. ix. fig. 6; pl. xi. fig. 6.

[3] *Eschara santonensis*, D'Orbigny, *op. cit.* p. 109, pl. 603, figs. 1–3; pl. 673, fig. 4.

[4] *Biflustra solea*, Novák, *op. cit.* pp. 94–95, pl. iii. figs. 12–16.